FLYING SAFETY

UNITED STATES AIR FORCE

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Safety With A Sunday Punch!

★ FLYING SAFETY AWARDS ★

In recognition for their part in the United States Air Force aircraft prevention program, Flying Safety Awards will be presented to seven organizations and installations in recognition of their outstanding safety records and commendable efforts in preventing aircraft accidents. Because of the importance of the flight safety program to the economy and effectiveness of the Air Force, and because of the importance of unit pride of achievement in promoting and accomplishing an outstanding safety record, such achievement is marked by award of the Flying Safety plaque.

For Meritorious Achievement in Flight Safety
January through June, 1953

CONGRATULATIONS ARE EXTENDED TO THE FOLLOWING WINNERS:

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Kadena Air Base, Okinawa (FEAF)

1707th Air Transport Group
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Albany, Georgia (SAC)

363rd Tac Recon Wing, Shaw AFB
Sumter, South Carolina (TAC)

2596th Air Force Reserve Flying Training Center
Hensley Field, Dallas, Texas

Air Force Flight Test Center
Edwards AFB, California (ARDC)

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FLYING SAFETY STAFF

Editor
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Managing Editor
Capt. John H. Moore, Jr.

Contributing Editor
Virginia C. Asmus

Production Control
Maj. Ben H. Newby

Art Editor
T/Sgt. Steven Hotch

Circulation Manager
S/Sgt. G. J. Dean

★ ★ ★

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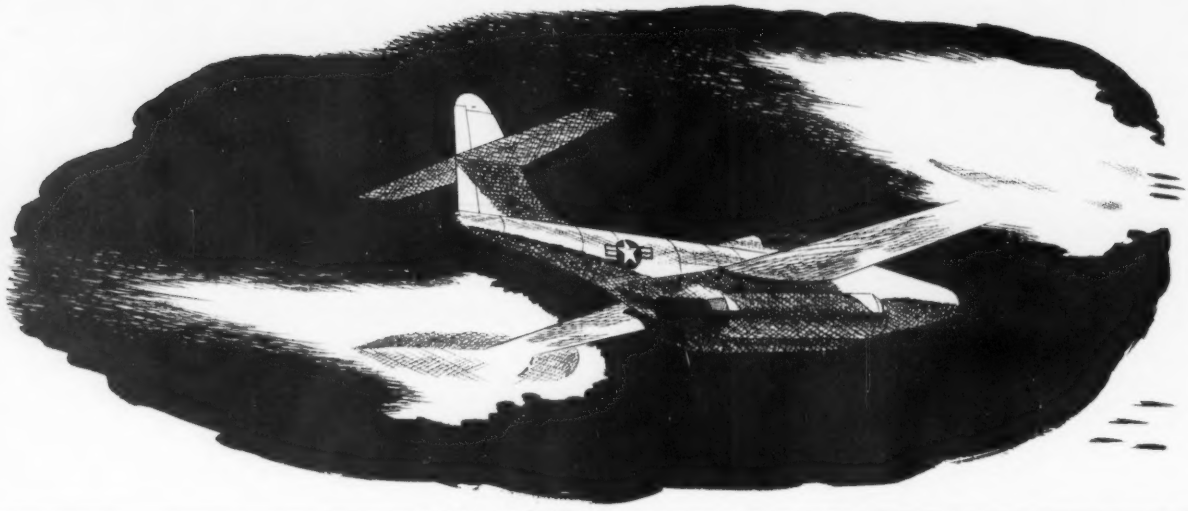
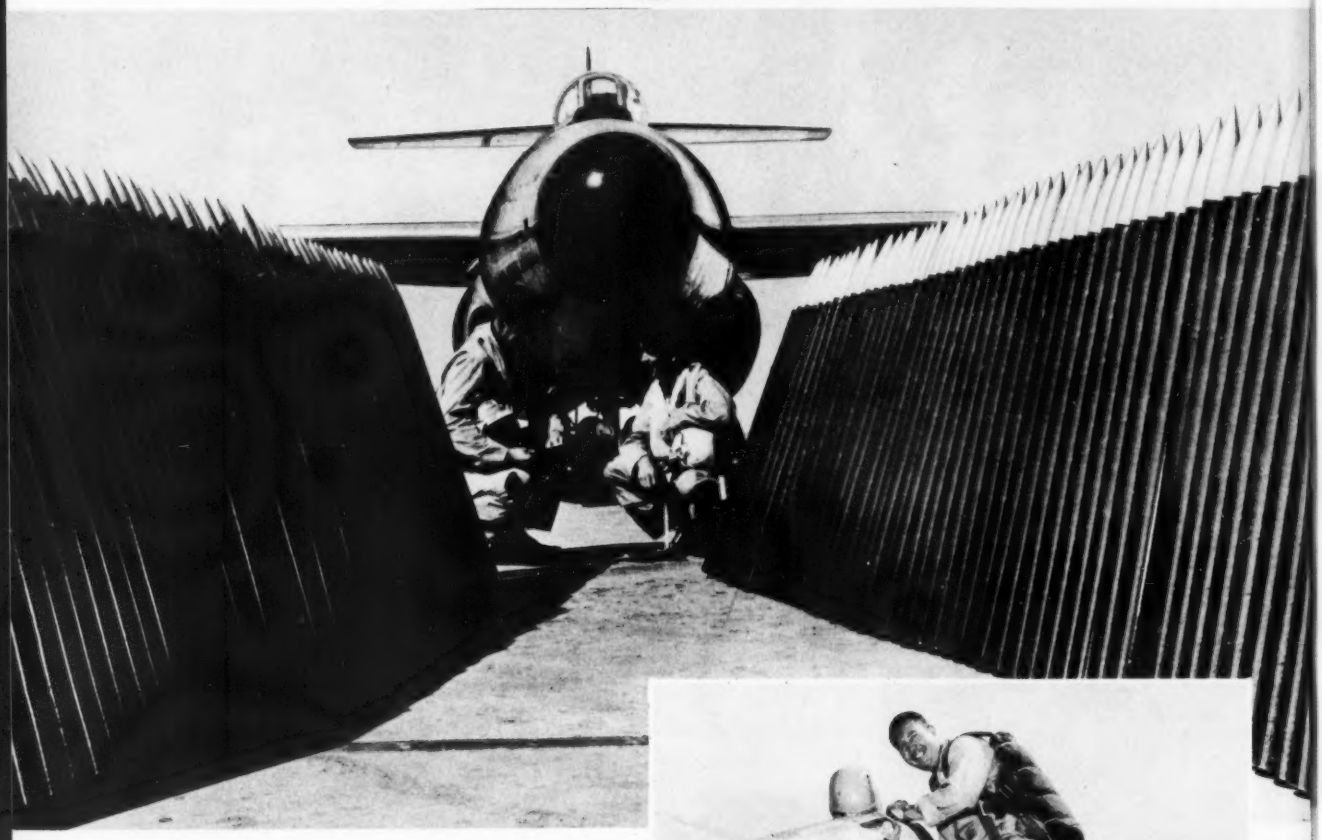
On page 16, read what one experienced pilot thinks about the uses for a radio compass.





This "picket fence" is formed by the 104 2.75-inch FFAR rockets that make up the F-89D's "Sunday Punch."

●

Engineering test pilot J. J. Quinn climbs aboard his aircraft for another mission in the F-89 test program which he conducted at Edwards AFB. Quinn was the first to fly the YF-89 and was at the controls of the first production model of the F-89A off the line.

. . . safety with a SUNDAY PUNCH!

THE F-89D IS A BIG AIRCRAFT, EQUAL IN SIZE AND WEIGHT TO A WW II MEDIUM BOMBER, DESIGNED TO PERFORM ITS MISSION SAFELY.

By J. J. Quinn, Engineering Test Pilot, Northrop Aircraft, Inc.

THE tactical mission of all-weather interception means high speed and a fast rate of climb. It means the airplane must carry plenty of radar gear for locating and intercepting the enemy, a fire control system and armament capable of a single-pass knockdown and sufficient electronic equipment for communication and navigation on GCI, plus all-weather flying instrumentation.

The F-89D was designed for all of these. And, in addition, the designer provided two engines to increase all-weather dependability and give top performance while carrying this heavy load of electronic gear and armament.

Many Features

Let's consider some of the other features of the F-89D. A profile view of the airplane discloses a high upswept tail assembly, which creates the characteristic "Scorpion" silhouette. The horizontal tail, located halfway up the vertical stabilizer is above the turbulence caused by airflow leaving the wing, thereby giving excellent control effectiveness. Our engineers feel the aerodynamics of the plane's straight wing and high tail combination offers the most desirable configuration for this interceptor. The wing is also more rigid than a sweptback wing, permitting armament to be carried on the wingtips. Armament stores, such as the heavy rocket load of the F-89D, are carried close to the C.G., eliminating great changes in pitch after firing. Moreover, the plane has no aileron reversal tendencies at high Mach, nor does it have any pitch-up tendencies due to elevator upfloat.

Official announcement that it is in the "600-mph-class" points up the F-89D's ability as a high speed aerial defender. It can locate and intercept hostile aircraft at altitudes in excess of 45,000 feet.

The F-89D is a big airplane, equal in size and weight to a medium bomber of World War II. It measures 57' 10" from wingtip to wingtip; is 53' 10" in length, and 17' 6" high and weighs over 40,000 pounds.

It carries a two-man crew; the radar observer seated tandem directly behind you becomes your "eyes" on an intercept mission. (Operational analysis by Northrop designers indicated the two-man operation essential for the combat effectiveness of the F-89D since optimum operation of radar to successfully perform the mission is a full time job.) Successful completion of the F-89 mission depends upon the ability of you and your R/O to think and act as a team, technically and psychologically.

In addition, the R/O is in effect your "insurance," your constant flight safety engineer. Not only does he operate the radar equipment, but also he mans numerous other communication devices in maintaining contact with ground stations and other friendly aircraft, and in operating radio navigation equipment. Further safety insurance is his constant contact with you through instruments and a voice intercommunication system. His cockpit instrument panel board enables him to double check your procedures through most phases of flight. The highly effective radar system is useful not only on intercept missions, but as an added safety factor since it can be used to monitor minimum weather landings when the field is weathered in.

Heavily Armed

The Department of Defense has permitted disclosure that the F-89D is America's most heavily armed interceptor. It carries its 2.75 inch FFAR rocket armament in permanent wingtip launching pods. The wingtip pod location for the rocket launching platforms is a "natural" from combat and safety standpoints, and offers some advantages over conventional fuselage or underwing locations. It permits large numbers of rockets to be carried and secondly, and highly important from a flight safety standpoint, firing doesn't interfere with the crew vision at the critical moment of breakaway from rocket gases or debris being sucked into the engines or into the air conditioning system and cockpit. Design of the tip pods is such that a malfunctioning rocket will burn out without danger.

Earlier models of the F-89—the B's and C's now operational with fighter-interceptor squadrons of the Air Defense Command—carry six nose-mounted 20mm cannon.

The F-89D is an easy airplane to fly, with remarkably "honest" handling characteristics. All flight controls are 100 per cent hydraulically powered. The full-time control system features irreversibility of control, an extreme advantage in high Mach airplanes because of the irregular loads imposed as compressibility

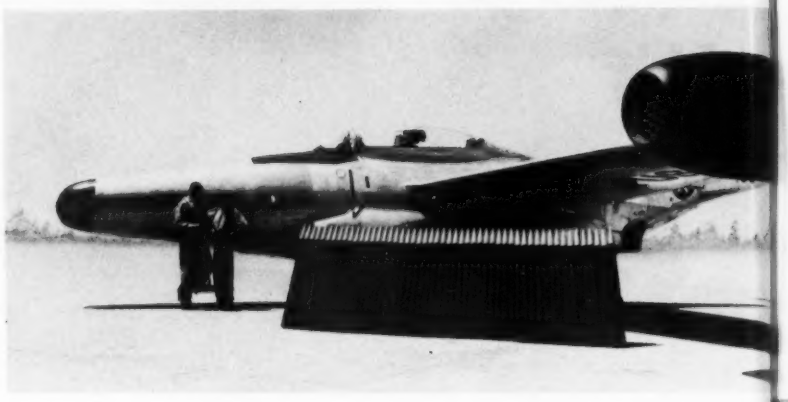
shock moves back and forth over the control surfaces.

To enable the pilot adequately to determine the amount of control movement on the F-89D, "feel" is created simply and genuinely by springs attached to the stick and rudder pedal mechanisms. For the elevator, additional help is provided by a force-fuel system consisting of a force bellows and bobweight combination which produces "feel" in direct proportion to air speed and load factor.

Twin engine reliability of the 600-mph-class airplane is of vital importance to the crew while flying interception missions. Tests have proved that in event of an engine failure after takeoff or during the mission, the F-89 is capable of returning to its base on the one remaining engine. This reliability is particularly valuable as a safety factor on missions over mountainous terrain or over water. In addition, should the airplane lose both engines on a mission, it is provided with an emergency flight control system, tied in with the highly effective full power control system, which enables the pilot to operate the controls and make a "flameout" landing without powerplant function of any type. The F-89D is powered with Allison-built J35-series turbojets with thrust-augmenting afterburners.

The possibility of fire must be considered in any aircraft. In the F-89D, the fire extinguishing system has overheat detectors and fire detectors in each engine nacelle, and an extinguisher bottle in the nosewheel well with a discharge line to each engine. Overheat lights, fire warning lights, and controls for the extinguisher bottle are on a panel in the pilot's compartment. When either engine fire selector switch is moved to "emergency," fire wall shutoff of fuel is accomplished, and the electrical circuit for the fire extinguishing system is armed.

When the pilot closes the discharge switch, current flows to the selected discharge valve on the bottle, and the cartridge is fired, piercing a disc, and discharging the bottle contents into the manifolding of the engine. The agent vaporizes and dilutes the oxygen content of the air in the engine bay so that it will no longer support combustion, extinguishing the fire.



Pilot psychology was engineered into the pilot's compartment to make it an easier airplane to fly. Our engineers designed all cockpit controls so that they have a "natural reaction." Each control handle is contrived to have a motion in the same direction as the movement of the component it operates. Control knobs throughout the cockpit have also been designed into various different shapes so they can be readily identified by feel as well as visually, which is an advantage in all-weather and night operations.

Decelerons Control

While you're in the cockpit, you'll notice a control located right alongside the throttle. This controls the "decelerons," which enables you to reduce flight speed rapidly and still retain full control of the ship. Decelerons are jawlike control surfaces at the outer end of the wing trailing edge, which perform double duties as ailerons and fighter brakes. In normal flight, the jaws are closed and the controls function as ordinary ailerons. In dives, they open full for braking effect.

This split-aileron type speed brake has no adverse effect on aileron control. In fact, a slight amount of speed brake opening increases aileron effectiveness at high Mach. Also, since the speed brakes are symmetrical and since they are located almost in line with the airplane CG, their use has a negligible effect on trim. They give excellent airspeed control without changes in power setting, permitting a high rate of closure in combat while leaving maximum power available for a fast breakaway.

This air speed control also allows ample power to be maintained during the landing pattern and final approach in case a go-around is necessary. The unique dive brakes are a most effective means of speed control and are useful in formation flying, in dive recovery, in fast letdown from altitude, in minimum radius turns and in reducing ground roll distance.

The F-89D has remarkably short takeoff and landing characteristics, considering its speed and size. I've taken off at Hawthorne using only about two-thirds of the 5000-foot runway. Landings are also possible in comparative distances. No auxiliary devices are required to shorten the landing roll to this remarkably short distance. Of particular value in reducing the landing roll are the decelerons or "dive brakes," just mentioned.

Let's for a moment consider we have come into the pattern for a landing. The gear is dropping. If we could crawl under the airplane and watch the gear coming down, we'd notice that the last part of the nose gear movement is aft, which means that it will always be locked into place. There is no chance that it will be only partly down, because the air loads will shove it into place. The dual nosewheel has been designed so that it gives you good control on landing. You get immediate and continued good response, with no tendency for "mushing." The design, on a co-rotating axle, makes the gear wheels pull against each other and offers an excedingly safe

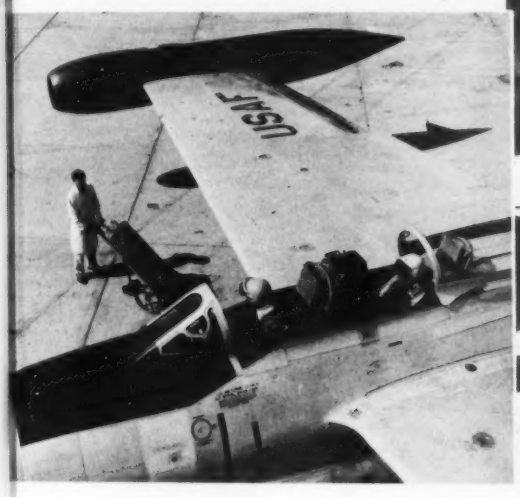
Left, the 20-ton F-89's configuration is designed to accommodate a large assortment of lethal armament.

●

Right, test pilot Quinn briefs Brig. Gen. C. D. Vincent, VC, WADF, on preflight inspection procedures.

●

Below, there is no substitute for safety. Utilizing the checklist from prestart to shutdown eliminates the possibility of overlooking any part of a procedure.



installation that requires no shimmy dampers.

Safety In Design

Safety of the pilot and R/O, as well as combat effectiveness, has been a primary design consideration in the F-89D. The crew compartment is big and roomy. This can be borne out when I explain I am six foot one and weigh 200 pounds, yet still find plenty of room for complete survival equipment without having to be "squeezed" into the pilot's compartment. The radar observer, similarly finds plenty of "elbow room" in the rear seat.

Naturally, like all modern military fighter airplanes, the F-89D has bail-out provisions for crewmembers, using ejection seats. Normally, the canopy is jettisoned, then the crew-members arm their ejection seats and are exploded clear of the airplane.

Another safety feature of the F-89D is its anti-icing system. The thermal system ducts hot air from the engines to various surfaces to prevent or remove ice formations, and does not affect the clean lines of the airplane with external attachments such as boots or blankets oftentimes used on leading edges for anti-icing.

Northrop is now undergoing the final phases of an extensive modification program to increase the ruggedness and tactical usefulness of F-89 airplanes, in accordance with U.S. Air Force instructions. The modification, effective on all F-89's, includes a wing rework that greatly improves structural integrity and high speed, low altitude stability characteristics. New, stronger wing attach fittings have been installed and the center and outer wings were beefed up generally. Wing tiptank fins improve the stability of the airplane.

While there are several rules or precepts considered a "must" if you are to get the most out of flying an F-89D, one which I might mention here is:

Fly cautiously in turbulence.

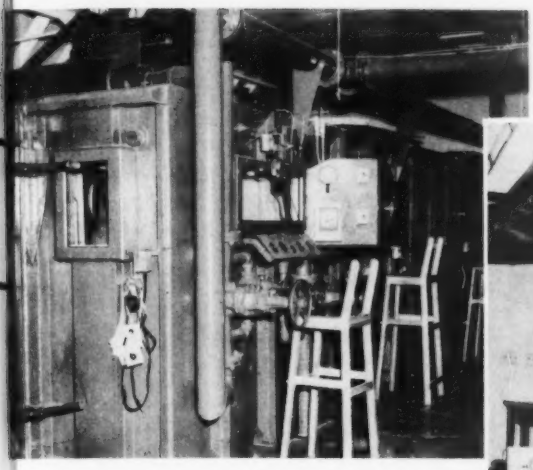
Avoiding thunderstorms and severe turbulence makes sense. Of course, in combat, it may not be practicable. However, heavy turbulence, combined with high speeds and swift maneuvers can set up G's beyond design capabilities. It follows that airspeed and maneuvering should be reduced for turbulent air penetration.

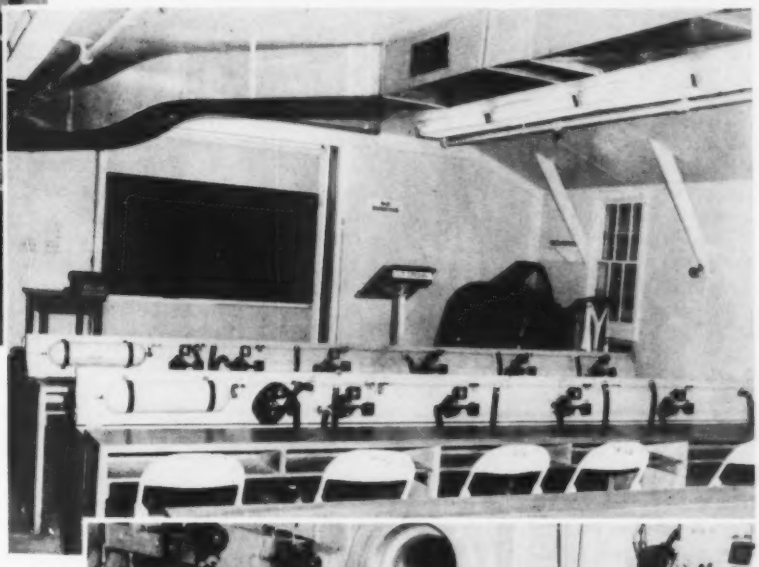
I live with all the precepts of safe flying of jet aircraft until they become second nature. But never to the point where I wilfully get careless or automatic in mind and motion. Sure, a lot of my manual and pedal actions are now reduced to reflexes but I try to keep mentally alert. It takes a little effort if you do. It costs like the devil if you don't. ●

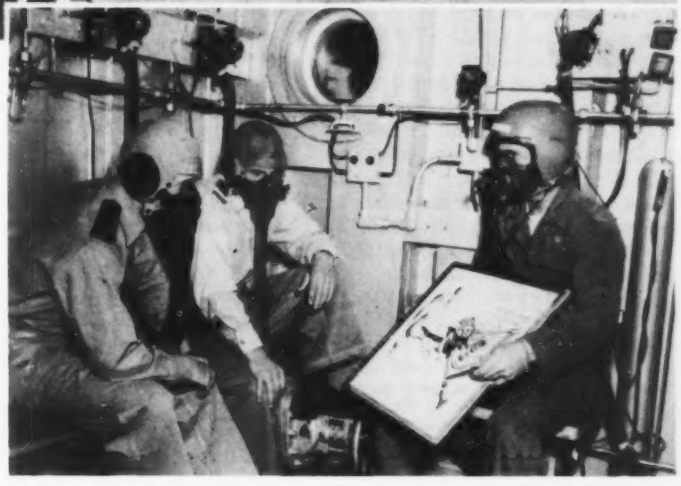
UNDER PRESSURE

After a thorough classroom indoctrination, students make their first "flight" in the pressure chamber.

Students at Craig AFB are taught the rules for safe flying at altitude. By experiencing hypoxia and observing hypoxic reaction they learn oxygen discipline.







Left, ascents and descents are regulated by the instructor on the inside through an intercom system. Center, students are taught every quirk of the oxygen system before entering the pressure chamber. Below, an instructor uses a diagram to explain what causes difficulty in clearing ears during a descent.

THE class of 20 men filing into the altitude chamber was a study in contrasts. Most of them were aviation cadets, but there was a liberal sprinkling of officers . . . instructor pilots, and men from major commands on TDY for jet transition training. Ages varied, too. Here was a 20-year-old; behind him a greying Major. The new Air Force and the old were here, both vitally interested in the same problems.

The class had completed its classroom indoctrination. Sitting at specially-equipped desks, they had disassembled and reassembled equipment until they knew every quirk of the system. They knew how walk-around bottles worked; they had learned how to check mask hose-clamps, regulator connections and blinker indicators. Not the least important, they knew how to fit their masks correctly. These men knew aircraft oxygen systems inside and out. Now they were ready to go through the altitude chamber.

Vital Training

This "tank" training is all important. Although each class is drilled in the physics of the atmosphere, and knows the reasons behind hypoxia, decompression sickness, explosive decompression and acceleration, few USAF pilots have very much time above 18,000 feet, especially on their own.

What does 18,000 feet mean in terms of physics? Well, the air pressure at 18,000 feet is only one-half an atmosphere; that at 27,452 feet is one-third of an atmosphere, and that at 45,500 feet is one-seventh of an atmosphere. This means that the higher your altitude, the less the oxygen pressure both in the atmospheric air and in your lungs.

For instance, you stand on the beach, dipping your toes in the water. At this sea-level pressure, you have 11 tons of air pressure on your body, distributed equally. Now you jump into your flying machine and climb to 18,000 feet. The 11 tons of air pressure have decreased to five and one-half tons, and this pressure decreases as you climb higher. This decrease in air pressure is what brings on the "bends," a condition that also bothers deep sea divers and tunnel men.

What causes "bends"? Without confusing you by stating Henry's Law, the bends is caused by the inability of the nitrogen dissolved in your tissue fluids and blood at ground level to stay in solution as the air pressure decreases. At reduced pressure altitudes, nitrogen bubbles form and produce a variety of symptoms, some of which may be extremely dangerous.

At 63,000 feet, unless the body is subjected to additional pressure, as furnished by the T-1 pressure suit, the blood actually boils and the pilot's skin swells.

After members of the class have entered the altitude chamber and

signed the record sheet, they are seated comfortably in a circle around the qualified instructor who is always present in the chamber when tests are being run. Each student wears a cloth flying helmet, with earphones. The headsets and helmets are checked by the instructor, but the oxygen masks are not connected . . . yet.

The intercom is switched on, and the instructor tells the class that the first ascent will be made to 6000 feet. The pressure is then reduced to that present at the 6000-foot level.

The class next descends to 3000 feet at the rate of 1500 feet per minute. This is done to check the students' ears. If any student reports difficulty in "clearing his ears" the crew carefully increases the air pressure to that of ground level.

If no one reports a difficulty the class is taken to 18,000 feet, without oxygen, and asked to read a card. Then masks are donned immediately and oxygen taken by the student. With mask and oxygen he is asked to read the card again. This is part of a night vision test. The student can easily see how much greater is his vision at altitudes with oxygen. From 18,000 feet, with oxygen, the student is taken to 30,000 feet. During the "climb" it is made clear to every man in the chamber that if he feels any unusual symptoms or any pain, he should notify the instructor at once.

Climb Completed

Now the long "climb" has been completed. The chamber levels off at 35,000 feet. The altimeter needles come to rest.

At this point the instructor calls for a volunteer to demonstrate the effects of hypoxia.

A brave soul raises his hand and the instructor removes the subject's mask, warning him that there may be a change in personality. The most introvert man may suddenly become a Milton Berle. The subject goes through hand coordination tests for nearly one minute, then his head drops on his chest. He's out cold! The oxygen mask is immediately replaced and the "guinea pig" comes around, with no ill effects.

After this demonstration, the chamber altitude is dropped back to 25,000 feet, and part of the class is given a new series of coordination tests.

Here at Craig, a wooden peg board is used. The pegs, with square shanks, can fit into the square holes in only one way. Each peg is painted half white and half black. Each subject is asked to pull a peg, turn it 180 degrees and place it back in the peg board.

With masks removed and the subjects experiencing a feeling of exhilaration, pegs are quickly changed—correctly at first. Within 30 seconds some of the men slow down and there is a general fumbling. At the 35-second interval, few of the subjects can fit the pegs. At 60 seconds, peaceful oblivion reigns over the subjects.

At 25,000 feet the students will remove their masks and take a series of coordination tests. The inability to fit pegs in a board shows effects of hypoxia.

The oxygen masks are replaced and the subjects revive. Once again there is no difficulty in turning the pegs, and most of the men won't believe they blacked out temporarily.

This peg-board demonstration proves the importance of oxygen discipline and training. Whereas a healthy man can hold his breath at sea level for a minute without being distressed, at 45,000 feet he will be out cold in 20 seconds.

This demonstration proves that hypoxia can creep up on you without warning.

After the demonstration the class is returned to ground pressure. As they step out of the chamber, the instructor checks each man for ear difficulty. Near the altitude chamber is a recovery room, completely equipped for an emergency.

The altitude chamber at Craig Air Force Base is under the direct supervision of Lt. Col. William S. Dandridge, M. C. Every safety precaution is taken, and the "tank" is checked regularly for any malfunction. There are two separate oxygen systems—one for routine use and one for emergency.

Complete Training

Each flying student at Craig must go through the entire physiological training program, including the altitude chamber; IP's must take the course every two years. Men over forty years of age are carefully checked by the flight surgeon, and may be granted waivers to enter the chamber. As each student completes the course, his records are checked and notes of any difficulties are made.

The record of the indoctrination course at Craig is enviable. Some 250 students each month are processed through the Physiological Training Center, and over 4500 men have completed the course to date, without any serious difficulty.

The Physiological Training Unit at Craig has one and only one mission — to teach *Safety in Altitude Flying*. By experiencing hypoxia and observing the reactions of hypoxic individuals, the importance of oxygen discipline is indelibly stamped on the mind of each man. He learns what will happen to him unless he knows how his equipment works, how to use it, and the disastrous results of failure to use it *properly*. ●

Jet shock waves are mighty disconcerting to the general public. They cause damage and create ill will for the U. S. Air Force.

Mind yer Manners!

THE PEACE OF SUBURBAN Los Angeles was rudely shattered one afternoon when a giant shock hit the city. Sounding like the crack of doom, it broke store windows and rattled bric-a-brac. Occupants of local bistros who had not seen daylight for months were brought out into the mid-day sun to gape skyward. Newspaper and police switchboards were swamped with incoming calls.

All because one sound-happy jet driver dived his machine through the sound barrier, too close to a populated area.

Newspapers made headlines of the story . . . and the publicity wasn't good . . . for aviation or for the Air Force.

During the past summer there have been at least twelve reports on sonic "boom" phenomena. And the worst part of it was that because of the altitude of the offending airplane, and the wide area affected by the shock wave, the culprit wasn't caught.

To the public it was just a "jet airplane." It could have been flown by one of the services or by a civilian test pilot. Because the public automatically thinks of jet aircraft in terms of the Air Force, thousands blamed it on the USAF.

Although there has been much comment on the part of reporters, aviation experts and just plain Monday morning quarterbacks, it is generally accepted that the shock wave phenomenon is caused by a jet aircraft passing through the sonic barrier in a straight dive.

As the airplane enters the barrier, it has the effect of compressing the air mass ahead of it into a hard cushion, or pillow of air. This mass attains high speed, building up pressure as it goes along, until it hits something solid . . . the ground, a housing settlement or a group of people. The result may be likened to the actuating of a pile driver. The great mass of air strikes with tremendous force and the noise is similar to a dynamite blast. There is a primary explosion and shock, with diminishing recurrent shocks following closely.

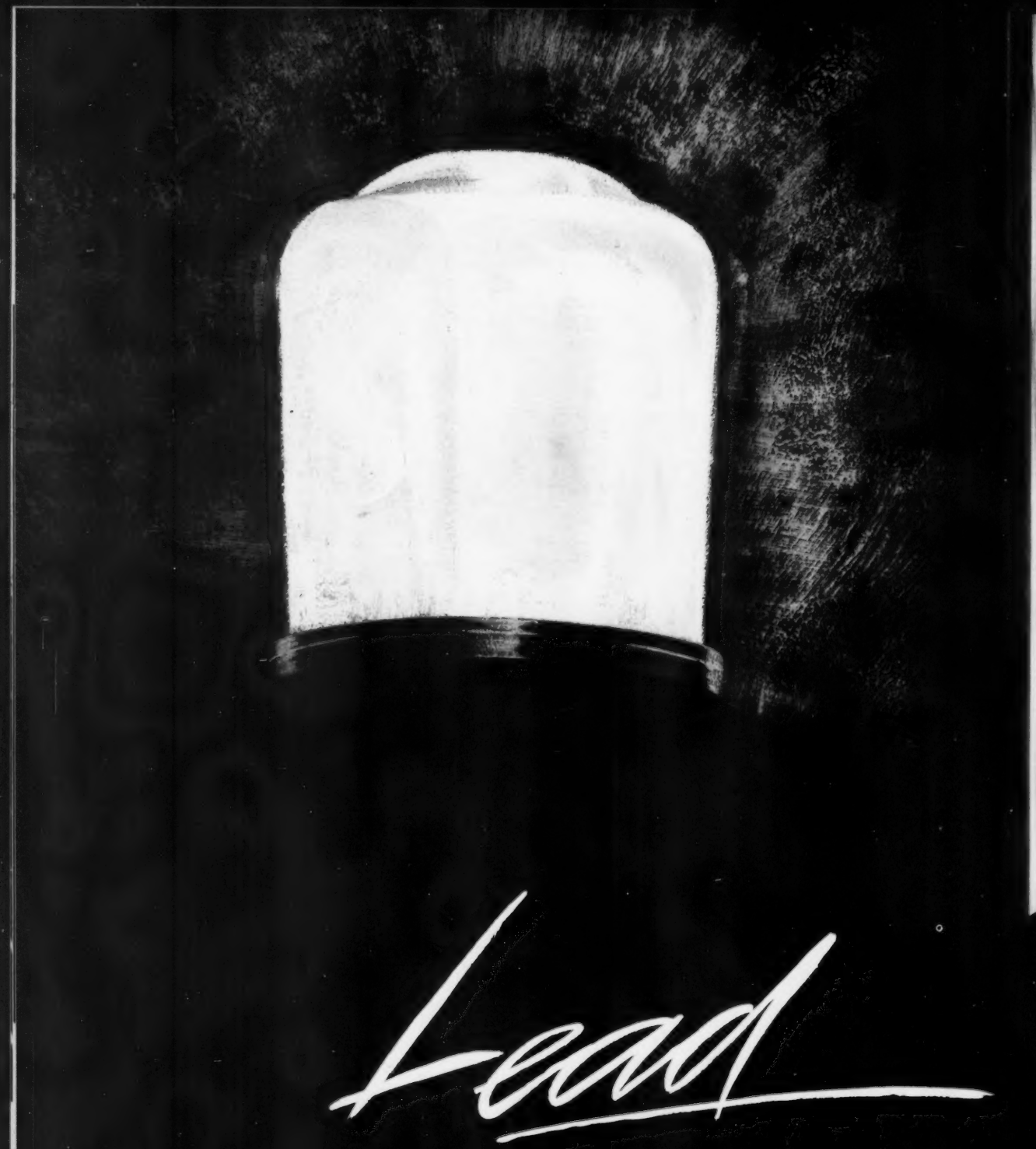
It was first believed that the shock wave was caused by a sharp pullout from the dive, after the airplane had passed compressibility, but experiments at Edwards AFB and by FEAF fighter pilots have proven otherwise. It's just a straight dive through the barrier.

To date, the "sonic boom" is generally believed to be a characteristic of F-86 aircraft and most reports have emanated from areas where F-86s are being operated by personnel of test centers and where practice intercepts have been made on Operational Readiness Inspection exercises. It is no secret that F-86s can enter the barrier more easily than can other operational fighters . . . to date.

The Air Force, however, is concerned about this phenomenon not only in the case of F-86s, but because new jet aircraft can skim through the barrier flat out . . . straight and level. And of course this would bode all kinds of trouble with the populace.

The solution to this situation is simple. The answer is air discipline controlled by strict supervision of pilots. Wherever possible, ORI intercepts should be planned for areas where houses are few and far between. In general, pilots should be warned, even directed, to abstain from diving aircraft over populated areas. It seems that when AFR 60-16 was hatched, no one ever dreamed that a pilot could buzz a community from 25,000 feet. But it has been done, as this story shows. Although a sonic buzz job is not strictly within the confines of regulations, a stop to this practice, intentional or otherwise, can be effected by close command supervision.

There is no excuse for bad manners, in the air or on the ground. As our grandmothers often told us, fighter pilots should be seen and not heard. ●



Lead

A properly lighted field must offer a pilot two things—visibility and familiarity.

THE need for runway lights to delineate runways as an aid to air navigation was recognized many years ago. Many types of lights have been developed, and many lighting designs recommended. However, considerable uncertainty and a lack of standardization has existed within the many using and constructing agencies, both civilian and military.

Within these standards of configuration and colors, the strength of the lights and their physical characteristics must be reviewed every time new aircraft types are brought out, to insure that the facility provides the service required.

A properly lighted airfield must offer the pilot two things: visibility and familiarity.

First, the lights must be so designed as to give maximum visibility without glare; and, secondly, the pattern of the lights themselves must be so standardized as to lend familiarity to the pilot who is on final approach, or for that matter, circling for a letdown. This familiarity is important because it makes it unnecessary for the pilot to pause mentally and figure out which light is which and where his touchdown should be planned.

Candlepower Problem

The problem of candlepower is the least difficult of the two. Isocandle curves can be accurately plotted and mathematical requirements set up, with a solid degree of tangibility. For instance, it can be hypothetically determined by plotting values that if strings of lights on both sides of a runway are to be seen from the 90-degree point in a 180-degree turn, a candlepower factor of 1000 will be required.

It can also be determined that adequate candlepower for taxi and touchdown functions is 200. Because operations and procedures are for all general purposes standardized, and are governed by regulations and aircraft characteristics, it is possible to determine the general direction and distance from any runway light to an airplane during the course of any specific operational procedure. The candlepower required to reach the pilot's eye without glare can then be determined mathematically.

Because airfield lighting standardization is a very recent development and still has not been jelled completely, it is believed that the problem should be discussed here for the benefit of the user, in this case the military pilot.

Remember that since the USAF operates on a world-wide basis, the addition of each new base in a foreign country and the development of each new airplane creates additional complexities of standardization.

From the viewpoint of accident prevention, the problem of approach lighting standardization is extremely important because the lack of standardization within using agencies can be and has been a flight hazard.

A typical instance, on record in the files of the Directorate of Flight Safety Research, states that a primary cause factor involving major damage to a B-29 airplane was the non-standard approach lighting configuration at a certain overseas base. The B-29 crew had received transition in night flying in the ZI, using a certain approach lighting pattern. After a long overwater flight, the pilot attempted a night landing at a strange field. He became confused on final approach by the unfamiliar lighting pattern and the result was an undershoot.

Had standardized approach lighting been installed, the overseas airfield would have looked as familiar at night as the pilot's home base. The anxiety factor would have been negligible, and the landing would have been made under conditioned reflex circumstances.

The largest obstacle to standardized approach lighting has been the variance of opinion between not only the military services but between the services and civil aviation users.

It is natural to assume that there could be a difference in lighting design between countries that have set up their own standards of military and civilian air operations. But lack of standardization within various

military agencies is apparent. The governing factor has been the variance in airfield regulations, particularly those governing the length of over-run and obstacles within the approach zone.

Primarily, approach lighting designers are divided into two camps: the "slope liners" and the "nonslope liners." These are the two basic approach lighting systems and discussion between the two camps often ends in a heated argument which benefits the engineers but leaves the pilot without standardized lighting systems.

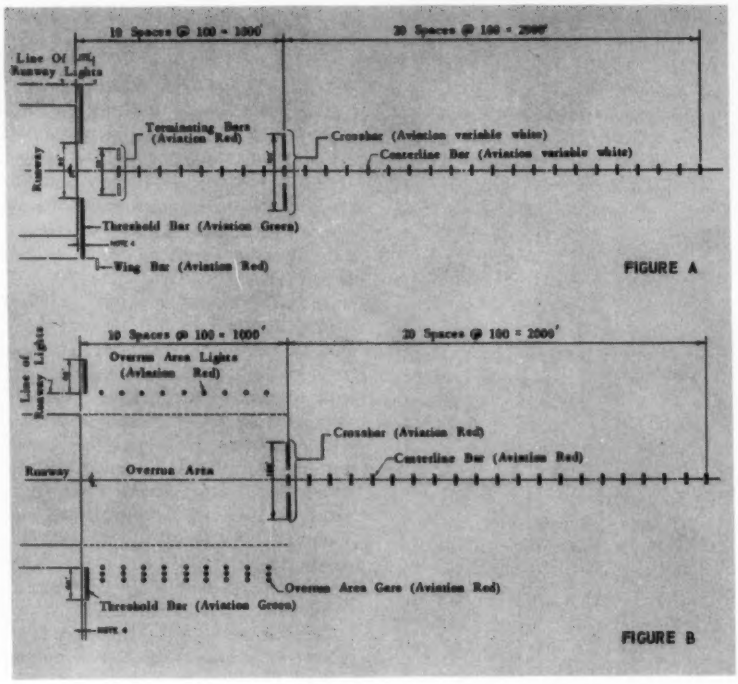
The goal of the ideal approach lighting system is one that will give accurate information to the pilot as to line, position, altitude and progress under conditions that conceal the ground plane (plane of the landing surface).

Most approaches are now restricted to conditions where a degree of visibility exists under an overcast, and the plane of the runway surface can be seen during final letdown. Under these conditions almost any recognizable pattern of approach lights will furnish enough horizon reference to allow a successful approach.

But when the visibility is restricted close to the level of the runway by light fog, haze, rain or smoke, the condition changes drastically. It is practically impossible for a pilot to look at high intensity lights, after breaking contact, and then go back on the gages. He must use lights and lights only, after he sees them (i.e., change at once from IFR to VFR).

The slope line system has a great deal of merit but it has not been "bought" by the U. S. Air Force or the Air Line Pilots Association. Its big selling point is that a "distortion" pattern of lighting is formed, and by various distortions of configuration, the pilot knows when he is off course, right or left, high or low on glidepath. Sort of like a gigantic ILAS indicator laid out on the ground, in general effect.

The slope line pattern, however, does not conform to Air Force regulations prohibiting obstructions within the over-run area. The slope line units project 10 feet above the ground and are installed within the approach path where they intersect the ground at an angle of 45 degrees. Consequently, the innermost (closest to touchdown) fixtures cannot be more than 50 feet from centerline, and



therefore they encroach on the over-run area. By the nature of their construction, the lights cannot be fitted with "break-away" standards, as are standard high intensity fixtures.

The slope line system is inflexible and is designed for a standard angle of letdown and line of approach. An additional weakness is that the slope-line glidepath and the touchdown point must coincide with the electronic glidepath and touchdown point. Once slope line is installed, it is fixed. It costs about $30,000 to change either the glidepath or the touchdown point if the slope line system is being used.

The nonslope line school argues that the most efficient and therefore the safest approach lighting system is that which conforms to the runway plane.

Although "flush lighting" is technically a misnomer, it fits the layman's description in that the lighting fixtures are "flush," or almost flush, with the level of the approach zone and runway. The fixtures themselves are usually standard high intensity lighting fixtures, equipped with red lenses, to distinguish them from the runway lights proper.

The lights are positioned at the edges of the over-run which is in effect a graded extension of the runway plane (although not necessarily load bearing).

Safety Factor

The lights are equipped with break-away standards which are easily and inexpensively replaced, should an aircraft swerve into them. The break-away load is about *two pounds* shear force, which reduces damage to airplane tires and landing gears. The lights are low enough to clear control surfaces and tailcones.

In July 1953, the Subcommittee on Aerodromes, Air Routes and Ground Aids, of the Air Coordinating Committee, charged with preparing a national standard on approach lighting, informally coordinated suggested approach light standardization.

This proposed national standard presents a basic configuration consisting of a centerline, crossbar and threshold bars as shown in the illustrations. This basic pattern permits three possible system developments to satisfy various operational requirements.

Chart "A" (illustrated) conforms to the preferred system recommended by the subcommittee. In addition to the basic layout consisting of cen-

terline, crossbar and threshold bars, it provides for a warning to the pilot that he is coming up on the threshold (landing end of the runway). This is done by the use of short terminating bars and wing bars located in the first 200 feet of the system. It also permits installation of sequenced flashing lights at locations where there is a need for a high degree of identification. System "A" (see illustration) is planned for locations having instrument runways, where no special operational requirements exist.

System "B" (illustrated) is designed as an acceptable alternate to System "A" for runways with over-runs. This system also retains the basic layout consisting of centerline, crossbar and threshold bars, but omits the row of centerline lights in the over-run itself in order to keep this area clear of obstructions in the approach path. This plan is in consonance with AFR 86-1 and AFR 86-5, a factor that has always entered into any USAF discussion of approach lighting standardization.

Instead of the centerline lighting, two lines of lights are placed (one on either side of the over-run centerline) to cover the section of the approach from which the centerline lights are omitted.

To avoid confusion, a distinction is made by specifying that each bar along the left hand side of the over-run area appears as three distinct lights. The line of lights along the right-hand side of the over-run appears as a single line of lights.

System "C" (illustrated) is intended to provide a high degree of flexibility without destroying the basic elements of the standard system. This system is primarily intended to provide the basis of an approach lighting system for civil agencies, that satisfy the needs of any particular airport. This system has the basic plan of centerline, crossbar and threshold bars, but introduces additional elements of guidance along each side of the center row of lights. System "C" was also designed to be installed at locations where the predominant flight operation will be by aircraft having poor forward cockpit visibility that requires maximum side-view guidance.

Length Question

A moot point, and one that has been discussed at length in standardization meetings, is that of the length of approach lighting. The USAF has always maintained that approach lighting contained within the normal 1000-foot over-run was adequate and safe.

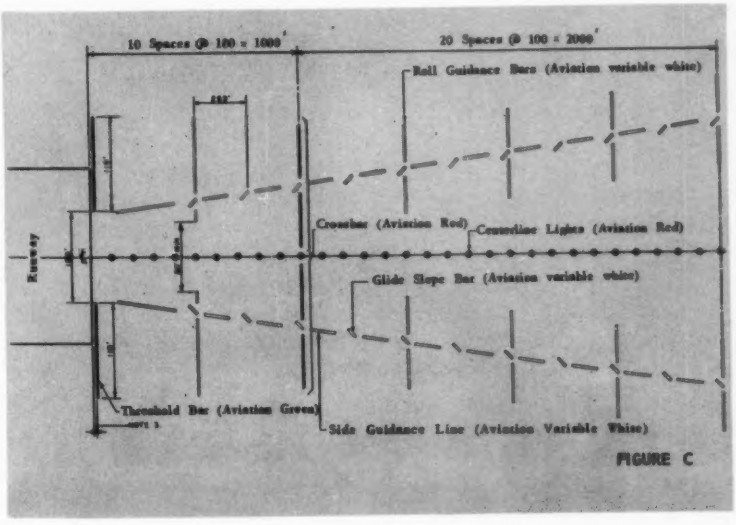
The subcommitte, in order to coordinate with USAF thinking, qualified the paragraph on system lengths by recommending that approach lighting lines of less than 3000 feet may be installed where special requirement of the military exists, or where terrain conditions prohibit the installation of a full length system. The subcommittee says, however, under no circumstances should the light line be less than 1500 feet in length. This gives the pilot a longer period within the approach light gauntlet and allows him a few more seconds to get oriented. It does not in any way change the length of the over-run itself, which has been established as 1000 feet. In view of steadily increasing approach speeds of USAF aircraft, it seems that the 1500-foot line of lights is an increased safety factor for night landings or limited visibility approaches, provided of course that funding is approved.

The greatest problems facing approach lighting design are introduced by the visibility restrictions imposed by the structure of the aircraft and by variations in approach speeds. No approach lights are of any value unless the pilot can see them clearly, and in reference to the runway. It is possible to combat obscuration by selecting adequate intensities, and by introducing enough of the pattern within the limiting distance. Restricted cockpit visibility can block out lights and patterns normally visible.

The problems introduced by high speed approaches present even greater difficulties. Approach lights cannot be made effective under obscured conditions to a pilot who is 200 feet above the line of lights. This restricts the effective length of an extended approach light line to about 3000 feet at a glide angle of two and a half to three and a half degrees. The pilot can see this length of light line for about 16 seconds at 120 mph.

If the pilot's approach speed is above 150 knots, with restricted visibility, it is doubtful if the pilot will derive anything but limited benefit from approach lights. So until electronic landing devices have been perfected, the alternative is to accept restrictions which limit landing operations to weather conditions that allow the pilot to break contact soon enough to orient himself by existing approach lighting systems.

Design of an ultimately effective approach lighting system under all weather conditions remains a challenge to those concerned with the problem. In the meantime, any approach lighting system that is effective, safe and standardized is a good system if it gains its end purpose . . . that of lining up the aircraft with the runway and indicating the boundaries of the safe landing surfaces. ●


10 Spaces @ 100 = 1000'
20 Spaces @ 100 = 2000'
Roll Guidance Bars (Aviation variable white)
Crossbar (Aviation Red)
Centerline Lights (Aviation Red)
Runway
Glide Slope Bar (Aviation variable white)
Threshold Bar (Aviation Green)
Side Guidance Line (Aviation Variable White)
FIGURE C

Getting The Most From Your UHF

BACK in January of this year, we briefed an accident under the heading of "UHF Panic." Possibly, a few of our readers will recall that lack of equipment and some rather senseless assumptions led to the destruction of two T-28s. Today, we are still in the midst of UHF growing pains and the thought occurs that a review of existing facilities may well be in order.

First, most of us agree that UHF is a sound step toward good communications. True, there have been many bugs to iron out, and we still have a long way to go to reach the projected goal. We do feel, however, that if you, as a pilot, will give a bit more thought to UHF flight planning, the old accident potential will be whittled down even more.

Musts for Pilots

What are the musts for a pilot contemplating an extended flight in a UHF-equipped aircraft? Let's sum them up:

First, common sense. This must be followed by a knowledge of the limitations of Ultra High Frequency equipment, a sincere interest in NOTAMs, and a thorough understanding of the latest Radio Facility Chart for the area to be flown. Couple these four prime requisites and you have the basis for intelligent flight planning.

Common Sense

We place common sense at the top of the list for this is a most necessary attribute to insure proper correlation of all other information available to the pilot. You can have all of the information in the world at your fingertips, but without proper application, it becomes useless.

Unfortunately, too many pilots have expected to find a time tested and operationally proved piece of equipment when first exposed to UHF. In most instances these individuals have suddenly been faced with the realization that this was not so and have taken positive action to preclude any possible accidents.

In order that UHF-equipped aircraft coming off the production lines would have suitable ground contacts, an interim UHF program was established using borrowed Navy equipment as well as some modified airborne radios. None of this early gear worked too well and was, in many instances, an accident producing potential. The picture today is changing somewhat for the better as permanent ground equipment is being produced and installed as rapidly as possible. This in turn means that the supply and maintenance headache

The ADC and CAA have worked out an experimental proposal to provide radar advisory service to aircraft in the Minneapolis, Kansas City, Albuquerque, Chicago and St. Louis Air Route Traffic Control areas.

The basis of the proposal is this:

Upon the request of a pilot, through Air Route Traffic Control channels, Air Defense radar stations will provide advisory information on detected severe weather areas and the safest flight path through these areas.

It is understood by all concerned that this service is not to interfere with the primary mission of the ADC or the traffic control of the CAA. Procedures for using this service will be published in Radio Facility Charts.

The UHF picture today is rapidly changing for aircraft of the USAF. Right, page 5 of the facility charts gives pilots the latest on interim channelization program.

is rapidly disappearing.

Study the Charts

The Radio Facility Charts certainly need no introduction. Except for the most recent changes, which will be found in the NOTAM files, these charts will give you a pretty fair picture of the UHF program. A bit of time spent studying the Radio Facility Chart is never amiss for any of us. Page 5 gives you a picture on the Interim Channelization program and should be consulted when planning a flight with UHF-equipped aircraft.

You will note that the majority of CAA Airways Stations (ranges) that are equipped with UHF are currently set up to *receive only* on Ultra High Frequency. This means that if you expect to establish two-way communication, and you have UHF command equipment, it will be necessary to tune in your radio compass on range frequency, and stand by to receive with the compass.

As we noted, page 5 of the Radio Facility Chart lists current channelization, but here's one joker in the deck. Because of the rapid changes that are taking place in the UHF picture, we find that in some instances the frequencies assigned to both military and civilian facilities do not always correspond to the frequency listings. Keep that in mind when flight planning and *always* refer to the Special Notices section in the Facility Chart before leaping off in a cloud of kerosene smoke.

Another point to bear in mind right now is the actual scarcity of UHF military emergency frequencies. Best you screen that little angle carefully before embarking on any form of extended cross-country. If you'll examine a current copy of the Facility Chart, you'll find a grand total of seven stations equipped with UHF/DF equipment throughout the entire country. Three of these are operated by the Navy. That's a good thing to remember.

Here's something else that is certainly worth checking carefully: You'll find, in studying the section devoted to Radar, that four USAF Ground Controlled Approach units do not have UHF frequencies while conversely only four civilian controlled GCA units are so equipped. We suggest that you remember this current situation when planning your flight. It could prove rather uncomfortable under some conditions to find yourself fresh out of GCA assistance just about the time the totalizer has given up the ghost.

Advantages

One of the projected advantages of UHF communications throughout the Air Force centers around instantaneous contact between airborne pilots and our forecaster service. When this program is finally a going concern, the advantages will be tremendous. However, at the present time, this service is extremely limited, with only three or four such Air Force stations offering this aid.

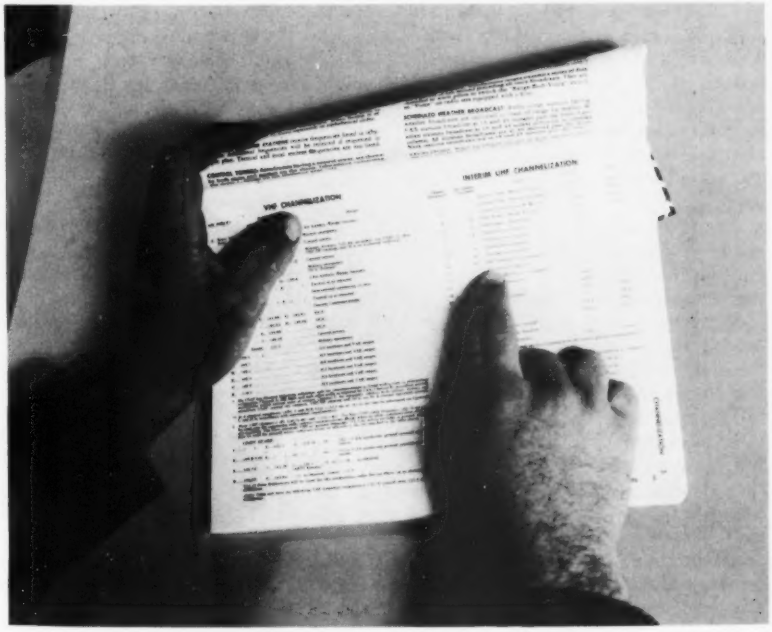
We've all had the necessity for studying NOTAMs drummed into our skulls for years. Of course there's always the rugged individual who proclaims that such stuff ain't for him, but as a rule he winds up on our statistical charts, and we'd honestly prefer to let those charts remain static as long as possible. If you are going to be tooling around in an airplane that is equipped with only the UHF command equipment, then by all means be doubly aware of the necessity for the NOTAM check.

The UHF ground program is in a constant state of change. In order to provide improved service and implement permanent ground facilities, changes are being made almost daily. With that in mind, you can see that it is impossible to maintain Radio Facility Charts in a state of completeness that is desirable. The only other answer then must lie with our NOTAMs. It is the only means of disseminating current information relative to facilities available for a projected flight.

Another very important *must* centers around your UHF radio equipment itself. We do not imply that it's any more critical than the old command set or the 522 or what have you, but it certainly must be checked carefully prior to takeoff. Make sure that your UHF is putting out a solid signal and receiving a like signal in return. By the same token, do not neglect your radio compass equipment. After all, it's virtually your only means of navigation and has to double in brass as your receiver for CAA traffic instructions from those numerous range stations that have UHF receiving facilities only.

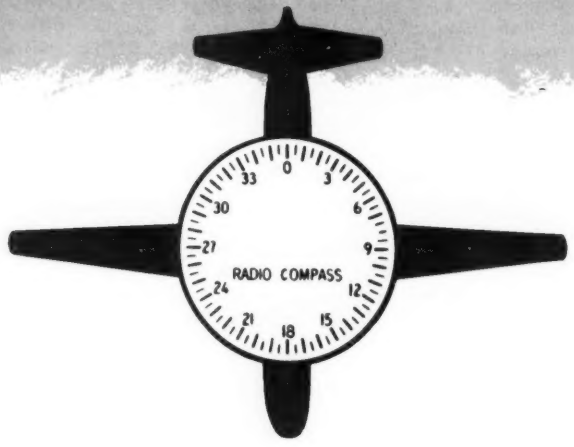
Well, that's about it. Plan your flight carefully. Determine *in advance* the stations and frequencies that will enter into the problem. Give the latest Radio Facility Chart a good work out. Study the NOTAM file and *know* where you stand.

And last, but not least, insure that your airborne radio equipment is working properly before leaping off.●



A PILOT'S BEST FRIEND IS HIS *Aural Null*

By Colonel Vincent J. Donohue, Headquarters, Kelly AFB



EVER been in heavy rain, dust, snow or ice crystals while actually on the clocks? The reception on your low frequency Command Receiver was bad or non-existant. Well, what did you do when you found your Command Receiver was going to be little or no help?

Chances are you used radio compass, selector on automatic. Took you to your destination like a homesick homing pigeon. Possibly you first tried putting the radio compass selector on antenna position. But that was too noisy. Not much better than the command receiver. Maybe then you wing tipped your loop and found the range course was too broad. Maybe you're not too sure what the score is when using the loop on manual, anyway. But then, you say, why worry so long as that radio compass on automatic takes you home.

Thunderstorm Finder

Well, there is a shortcoming to that procedure that you may discover some day, to your sorrow. In flying in or around thunderstorms, the automatic *direction* finding feature of your radio compass usually becomes an automatic *thunderstorm* finder. In mountainous regions where lodestone deposits are present, it is just as likely to become an automatic *lodestone* finder, too. When you're IFR, that's not good. So in some respects, the radio compass isn't all it's cracked up to be. But, and this is good news, in one way it is virtually unbeatable. Listen, now to the ungarbled word on how to use your loop.

There is an old adage about all roads leading to Rome. This saying can be parodied to apply to your radio compass with the selection on loop. It will then read, "All roads lead to Home." By roads here I mean the many ways of utilizing your *aural null* to get you safely home.

The first and most elementary of these of course, simply involves tracking inbound so that your path over the ground approximates the published magnetic course to the next radio fix. For example, flying standard four-course ranges in the mountains or along a coastline, occasionally even over flat terrain along toward evening, you can normally expect the particular leg you're riding to drift from side to side.

When you are at minimum altitude in the hill country, or trying to fly a nice straight course on instruments in a coastal defense zone, or in a number of other analogous situations, this inconsiderate swinging of the range leg can become disconcerting, if not hazardous. But what to do about it? You read my mind, amigo. Use your aural null.

Tune Carefully

Naturally, first a caution. Always tune your station in carefully with your selector on antenna. Once you have *positively* identified the transmitting station, the following steps will get you to your next check point, or your destination, without strain: (Chart # 1.)

- Place selector on Loop.
- Flip the CW-Voice switch to CW.
- Rotate the Loop until the needle points to 0° (360°) on the azimuth in the cockpit.
- Adjust the volume so that you get a good clear null, approximately five degrees wide, turning your air-

plane if necessary to get the null centered on the nose.

• Check the heading of your compass against the published range course of the station ahead and you will quickly learn whether you are to the right or left of track.

• Track in to the station, using your aural null and directional gyro to keep you on or to get you on a published course. Remember that it will be necessary for you to keep turning the volume control down as you approach the station in order to retain your five-degree null, the optimal width.

• Over the transmitter you will lose your null and your reception will be louder than at any time in the entire procedure. This broad signal is known as an "inverted cone," as opposed to the cone of silence you would normally get with your loop on the wingtip position.

• Positive checks on station passage, in addition to high signal volume, followed by rapid widening of the null once past the station, are marker beacon indications and a maximum reading on the tuning meter of the radio compass as you fly over the transmitter.

A second way to get your aural null to pay off is to use it to "spiral" down a cone. (Chart # 3.)

This procedure can be used to insure letting down safely into narrow valleys and landing fields in mountainous areas. The following constitute the simple steps involved:

• En route, while at cruising altitude, work a wingtip null procedure to get a time/distance check from the station.

• Verify your time estimate against actual station passage as a double check.

• Fly beyond the station for two minutes, one if operating in a "cylinder," then turn either right or left until you pick up a wingtip null. (For the sake of illustration, assume you turned clockwise to get your wingtip null.)

• Now maintaining a constant airspeed, adjust the loop and aircraft heading so that you get your null when the needle points to 80° on the azimuth.

• When you get a null on 80° on the azimuth, stop the turn and continue on that same course.

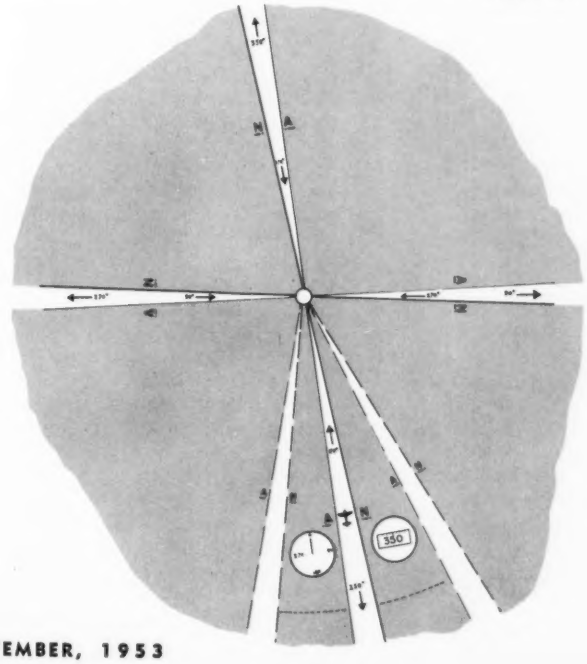
• Holding course, promptly adjust loop so that the indicator points to 100° on the azimuth.

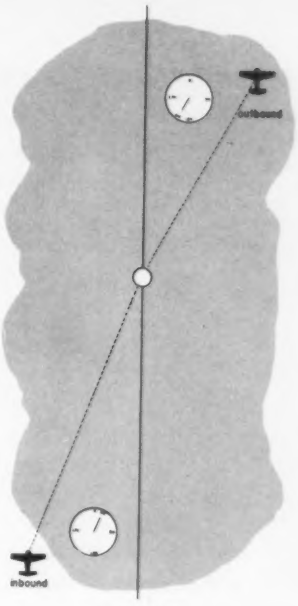
• When you get a null with the indicator on 100° while holding constant course, set loop indicator to read 80°, and turn right until you again get a null on 80°.

• Hold this course while null moves back to 100°.

• When you again get a null on 100°, repeat steps 7 and 8.

Using Aural Null in range flying when courses are swinging or multiples present. (Chart I)





(Chart II)

When paralleling desired course, your null (needle) is always directional, i.e., always indicates (left-right) the direction in which you must turn to get to your track.

This procedure keeps you at a constant distance from the station and enables you to spiral down the cone at any rate of descent desired, or you can use it for holding indefinitely. If you are descending, you can usually break your turn off to correspond to the heading of the landing runway adjacent to the transmitter, or to the reciprocal heading of that runway.

Feature Null

A third way of putting your aural null to good use is to feature it instead of the automatic direction finder to work a standard range letdown on published headings. Again reliability of the aural null makes this procedure safer than using your radio compass with the selector on automatic. The steps involved here are:

• Set up nose null as before.

• Track in to the station on published course.

• Check for station passage.

• Track outbound after passing station.

• On a three-minute flyout, before completing your procedure turn you should hold the heading of the initial portion of the turn until the 45° difference between the 180° calibration on the azimuth and the position of the aural null as indicated by the needle has decreased approximately

"On Automatic position, the radio compass may home in on a thunderstorm."

30°, i.e., in a right turn the needle and null will have changed position from 135° to about 150°, while in a left procedure turn the null will have moved back from 225° to approximately 210°. This gives you approximately a one-minute procedure turn. For varying flying times, adjust your timing during holding of initial portion of procedure turn by reducing it approximately 15 seconds for every minute less than three minutes of flyout time from the station. (Chart # 4.)

• After completing the procedure turn and while heading back to intercept the inbound course, adjust loop to 85° or 265° position of indicator on azimuth, depending on direction of procedure turn just completed. (Chart # 4.)

• When a wingtip null is obtained, either on the 265° or 85° position of the azimuth, turn to published inbound course and proceed to track to station. When you get proficient in the use of the aural null you can use it to "follow" the station all the way through the procedure and check your position against it at any time.

• Use methods given in preceding cases to identify station passage.

And yet, another method of using the aural null is worthy of mention here. Virtually every intrepid birdman and his brother is familiar with the method of using the null on the wingtip for time/distance checking purposes.

Few pilots, however, are conversant with the fact that it is not necessary for the station to be exactly off the wingtip before such determination of time or distance from the station can be undertaken. All that is necessary is that you tune in a radio station on either side of your course. This method cannot be used successfully if station is directly ahead or behind aircraft. Your steps are as follows: (Chart # 5.)

• Once station has been positively identified, get a null on it.

• Note the number of degrees between the position of your null, as indicated by the needle on the azimuth, and the zero calibration on the azimuth scale itself. Note the time on your clock at this point.

• Hold a constant course and maintain your airspeed for the length of time it takes your null to move to a position, as indicated by the needle, where the number of degrees btween its original position and the zero calibration on the azimuth has doubled.

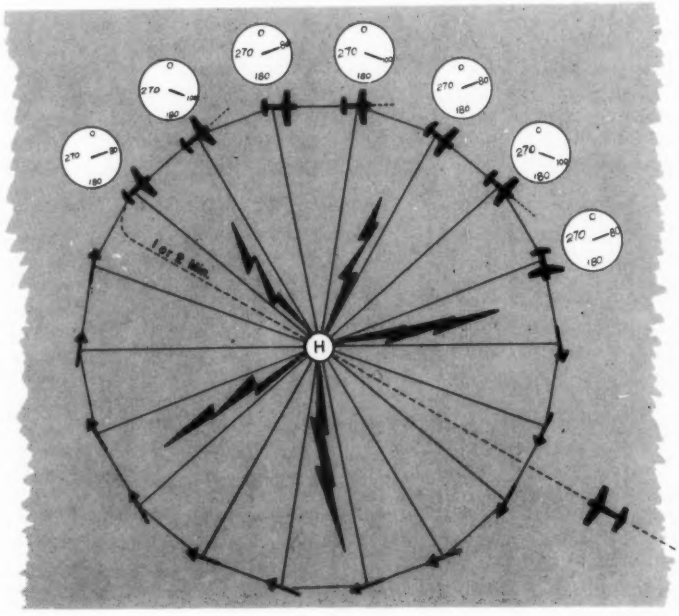
• The time taken for your null to double its distance (in terms of degrees of relative bearing) from the zero calibration of the azimuth is the time it will take you to fly to the station you are tuned to.

Distance to the ground can be obtained by multiplying your ground speed, in miles per minute, by the number of minutes you have ascertained it will take you to fly there from your present position.

Versatile Aid

All of the foregoing reference ways and means of using your aural null, which were described here in part to show you what a versatile and reliable radio aid you have when your radio compass selector switch is on loop

Use of Aural Null in holding at a constant distance from a station or in spiral descent around station. (Chart III)



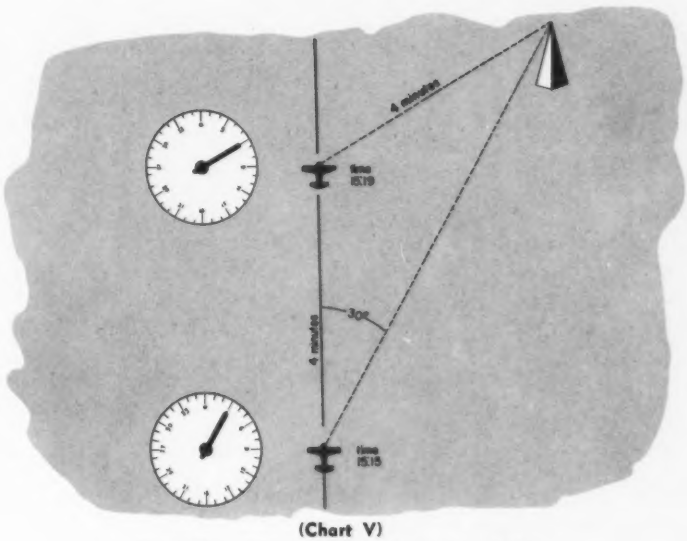
position, may be old hat to many of you. As a clincher, however, let us see what this little five degrees of silence can do for you in a bona fide emergency. Picture yourself in this kettle of fish.

The kerosene in your magnetic compass has been lost through a crack in the bowl. Your Fluxgate compass, or any other type you may have, is inoperative. Your HF and VHF radios are useless because of the static and equipment malfunction. The free air temperature is low enough to freeze your loop rotating mechanism in the position it happened to be in when you last used it. You have only an idea where you are and the soup is so thick you can't see your wingtips. What to do? Easy. Like shooting fish in a bucket. Your steps are as follows:

- Establish a gentle 360° turn to the right or left.
- With selector on loop, and CW-voice switch on voice, line up any radio station that the Facility Charts (T. O. 01-15-02) tells you is somewhere in your vicinity.
- Allow a minute of half or standard rate turn while checking for reception on each frequency you are trying for a signal. This will enable you to avoid missing any signals because of inadvertently being in a position where you would be getting a null on the station tuned in.
- Once you have a good clear signal, range or broadcast, stop your turn in the maximum signal position, and flip your CW-Voice selector to CW.
- Now begin a gentle turn, right or left, until you get a null.
- Hold this heading, using your turn indicator to do so, until the signal starts coming in again.
- Make a gentle turn either to the right or left and pick up your null once more.
- According to the rules of precession, if you found it necessary to turn left to pick up the null, the station is off your left. If you turned right to relocate the null, the station is off to your right.
- Now make a timed turn in the appropriate direction, equal to the number of degrees of relative bearing indicated by the needle on the azimuth. Stop your turn and concentrate on keeping your turn needle centered.
- You are now headed toward the station.
- A strengthening signal, since you do not have a null at this time due to the cocked off position of the Loop, will confirm that you are inbound, and you can fly in until you effect station passage.

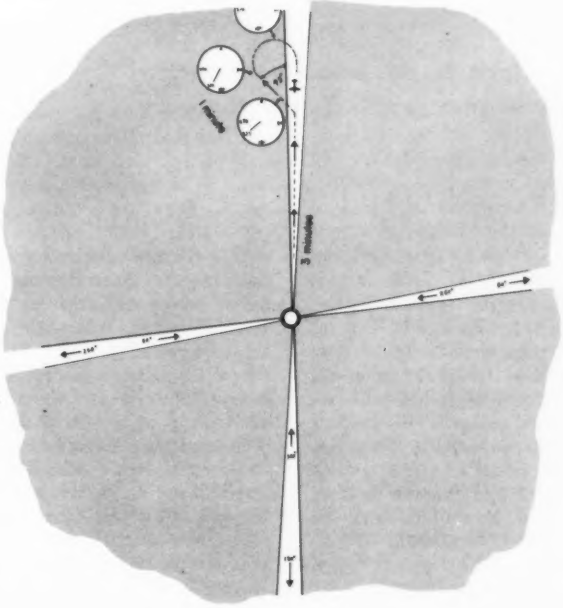
All of this at emergency altitude, or at least minimum safe altitude, for the area in which you are flying. No point in undoing a successful procedure by flying into a hillside.

Remember, practice makes perfect. A few dry runs in a Link, followed by a practice hop or two in an airplane, and chances are that you will become quite handy with an aural null and also will have added considerably to your longevity. Remember what I said at the beginning of this article? A pilot's best friend is his aural null. Right? ●



(Chart V)
Computing time and/or distance to station.

Method of approximating a one minute procedure turn on a three minute fly out from station.
(Chart IV)



Knowing what to expect in the way of weather, particularly in the wintertime, can do much to make a flight a safe one.

WHIMSICAL WINTER Weather

When the snow starts to fly, smart pilots know the weather before they leap off into the gray

EXCEPT for an excursion into the rain-making business, science hasn't done much about regulating the weather. The men with the shiny laboratories and the mathematical brains can't surround your airplane with a 50-mile radius of CAVU conditions at all times. Short of that, however, they offer the pilot a lot. They have designed aids which enable you to fly through bad weather. And they have made it possible to forecast with reasonable accuracy what the weather will be along your flight path.

Knowing what to expect in the way of weather can do much to make your flight a safe one. This is particularly true during the wintertime.

Three Things

When the pilot walks into the weather office just before winging off into the frigid air, he should be thinking about three things. The weather map will help him with all three. First, he should get in mind a complete picture of the current weather situation. Then, he should move the picture forward in space and time to cover the route of the flight. Finally, he should consider the changes that will occur during the entire trip.

The weather map gives such information in a pictorial form, and a brief survey of it, with the help of the forecaster, will show in a few minutes what would take hours to describe. Freezing levels, for instance, have been known to change as rapidly as a young lady's mind. The level may change radically within a short period of time or over a short distance. This is because of the change of air masses associated with frontal passages over various stations or with flying through a front. The pilot may anticipate variations by finding the freezing level

Even birds walk when it comes up freezing snow.

General knowledge of a region's winter weather is a must.

within each air mass over stations and considering the past movement of fronts and the approximate point at which the plane will fly out of one air mass and into another.

Two other familiar winter bugaboos—low ceilings and visibilities—also can be anticipated with the help of the weather map. The presence of a slow-moving warm or occluded front with precipitation ahead of it will bring the ceiling right down to the concrete. Visibility and ceiling are also affected by upslope fog, which is formed when air is lifted by prevailing winds up the slopes of mountains.

Some weather conditions, such as advection fog, are difficult to forecast. Advection fog may persist during the night but usually will become low stratus with ceilings of 100 to 500 feet during the day and, with sufficient heating, may break in the afternoon and form again about sunset. If, after consulting the weather maps, the pilot knows he is flying into such a doubtful area, he of course should be sure he has a good alternate.

Another winter problem, which may have been forgotten during the summer months, is the reaction of the pressure altimeter during flights into areas of different pressures or into cold air. Remember the altimeter will read too high when the airplane is flying from higher toward lower pressures. Flights into cold air will also have an effect on the altimeter. Since there is a rumor that some snow clouds consist primarily of mountain peaks, the altimeter error had best be planned for in advance.

Right now it might be a good idea to bone up on general ZI weather trends for the worst four months of winter flying weather.

October

For all practical purposes, October in the United States can be classified as the prelude of things to come. The problems that start occurring in that month merely become magnified as the months go on. October usually is considered a fall month, but in some sections of the country it is marked by extremely poor flying weather.

This is particularly true in the Far Northwest, where October is typified by fogs and low ceilings. In the Seattle area, for example, visibility averages between absolutely nothing and one mile. This condition prevails about a third of the time during the hours of 0300 to 0900, markedly improves during the hours of 1200 to 1800.

October also must be labeled as a very poor flying month along the California coast, with the chances of heavy fog and low ceilings being greater than in any other month.

In the Middle West Plains states, October brings a few active cold fronts, one or two active lows and a tendency toward ground fog formation during the sunrise period. The average height of the freezing level drops down to between 10,000 - 12,000 feet.

The Central East Coast during October has alternating periods of stable, fog-laden air when highs become

stranded off the coast, in addition to general rain and low ceilings.

November

Dark, rainy weather is typical throughout all of the Northwest during November. Interior areas are plagued with almost as much wet, foggy weather as the coastal sections. November ranks as the worst flying month of the year west of the Cascades, because of heavy snowfall in the mountains. The average height of the freezing level in the interior areas is down to about 7000 feet toward the end of the month.

The Las Vegas Area has the finest weather in November, but the rest of the Southwest is exposed to the first winter types of frontal and airmass weather. The rainy season is generally well established by early November. Through the Southwest part of the United States we find that the average height of the freezing level is down to about 8500 in the northern section and 10,000 in the southern section.

Around the Great Lakes Region, the instability effect is stronger during November, as cold masses of Canadian air move in across the warmer waters. The entire area has frequent blankets of stratocumulus clouds with accompanying snow squalls.

December

Unlike the West Coast, the East Coast has a more gradual approach to the bad weather peak which comes in late December and January. Lowering of the freezing level sometimes nearly to the surface, plus lack of good alternates in the area, makes December and January on the East Coast relatively bad, weather-wise.

During December, the Northwest and Northeast sections catch the brunt of bad weather, although major storms are possible and highly probable anywhere in the country. The Eastern storms are more likely to create widespread low ceilings and fog. Strong downslope winds prevail for a week or more at a time and the East slope of the Rockies usually provides the best weather in December.

Also in December, the interior valleys of California offer the most consistent stretches of bad weather, as fog is often continuous for days at a time, interrupted only briefly by slight lifting during the afternoons.

January

Considering the United States winter as a whole, January is the worst flying weather month of the year. Storm developments reach their peak of frequency and intensity, cold ground surfaces provide ideal conditions for fog formation, and airmass contrasts between ocean and continent are at a maximum.

Up in the Northwest, the entire area offers a continuation of the December pattern. The East slope of the Rockies again has the best flying weather because of the strong, westerly, downslope winds. January is the wettest month along most of the California coast, despite the local propaganda merchants, who make their livings from chambers of commerce. Fog is concentrated more heavily in the central valleys, but Nellis AFB and Edwards AFB are practically 100 per cent operational, and may be used as alternates most of the time.

Also in January, the Great Lakes and East Coast areas are particularly poor for flying. A high proportion of low ceiling and visibility occurs in connection with warm fronts lying to the south of the areas over the Carolinas or just off the coast.

That in brief is what can be expected during the wintertime in the United States. With the idea in mind that second-hand experience is sometimes best—and free, too—the wise pilot beginning a tour in an area outside the United States will learn from the old timers and the specialists what in general to expect from the weather. If this is your first winter in Japan, Okinawa, Northern Europe or some other part of the world away from the home shores, weather forecasters and pilots who have been there awhile can give you a lot of helpful tips on weather peculiarities.

With a general knowledge of the region's winter climate, a good weather briefing prior to flight, and proper preparation of equipment, no pilot is likely to encounter weather problems he can't handle. ●

No matter where you do your winter flying, the chances are that during the winter months you will encounter some special weather conditions peculiar to your section of the country. Each year Flying Safety Magazine reminds the flyboys just what to expect in the way of weather for each general geographical section of the country, during October, November, December and January.

However, the smart pilot doesn't just concentrate on his own backyard. He learns the general weather trend for anywhere he may have to drive an iron bird.

Consult your weatherman. He's a good guy to know when the thermometer reads low.

Cold weather can affect your altimeter reading and some clouds have hard centers.

Water repellent, not an eagle eye, is needed for rain-streaked windshields.

OVER THE YEARS, ALL OF US at one time or another have done a fair share of cussing and sweating when trying to ease an old bird down for a landing with an obscured windshield. Perhaps the screen was smeared with oil or rain or just plain foggy goo. In any event, it wasn't fun.

Probably the worst offender is rain. In any degree of intensity it's a potential troublemaker and when the clouds really let loose and drip, then the pilot often finds himself in quite a bind.

Both the Air Force and the Civil Aeronautics Authority have been working toward a solution to this visibility problem and several interim methods have been utilized with varying degrees of success.

Early this year the CAA published a Technical Development Report on distortion caused by rain on windshields. We are reproducing part of their findings below:

"It is a common experience to anyone who has looked through a rain-streaked window or has driven a car in the rain to see everything blurred and distorted. This effect is even more marked in the case of the pilot of an aircraft.

"The most difficult viewing tasks for the airplane pilot occur during approach and landing operations, particularly at night. The pilot is then dependent on a pattern of white and colored lights which he must be able to see and interpret correctly. These lights are signal lights rather than lights to illuminate the surrounding area. It is of the utmost importance, therefore, that they can be seen in their true relationship to each other and that the pattern with respect to the runway can be determined. Any distortion of the lighting pattern will hinder the pilot's effort and may delay or even prevent the landing of the airplane.

"The visual difficulties arising under conditions of rainfall can be assumed as resulting from the following factors:

- The rain between the airplane and the lights.
- The layer of water on the windshield.
- The effect of the air stream on the water on the windshield.

"Rain in the atmosphere between airplane and the lights will reduce the visibility of the lights. In addition to this reduction in visual range, the individual drops will cause scattering of the light and will tend to produce a halo around each light source. This condition is particularly evident when the droplets become small enough to result in fog instead of precipitation.

"The distortion resulting from the water flow over the windshield is caused by the varying thickness and non-uniform surface of the water. The curvature of the water surfaces causes the light incident on these surfaces to be refracted to varying degrees, and the image formed by this light is consequently distorted and partially obscured. In effect, the raindrops and water streaks form random lens surfaces over the wet area of the glass. This condition is magnified in a moving aircraft because its windshield intercepts a quantity of water that is nearly proportional to its forward velocity.

"The air stream blowing across the windshield during flight can have two counteracting effects. The motion of the air serves to blow the water off the windshield, thus tending to prevent the formation of a thick layer of water. With suitable flow lines, the air stream can even prevent some of the water from striking the windshield by deflecting the raindrops upward and sideways before they are intercepted by the glass. However, the effect of the air stream on water which does reach the windshield is to produce streaks, thus resulting in less uniformity of the water surface on the glass."

Type AA-1 rain repellent has been used with varying degrees of success for several years by the Air Force. It is generally agreed, however, that this agent leaves a great deal to be desired and recently WADC has given the green light for a newer product. This repellent is an anti-wetting compound known as Formula No. FC-10 and will soon be available Air Force-wide.

Properly applied to windshields, FC-10 holds tremendous promise and FLYING SAFETY would appreciate any first-hand reports of field experience with this compound. ●

BAIL OUT and SURVIVE

"I just felt suspended in space . . . . . ."

This pilot found out that confidence in his emergency equipment was vital when planning a careful, safe ejection.

Procedure for Ejection

1. Pull bailout bottle (should be connected at takeoff for high altitude flights).
2. Visor down.
3. Police up cockpit connections (i.e., oxygen hose alligator clip, etc.,—primarily to effect clean separation from the seat).
4. Jettison canopy (be sure that head and body are down low in aircraft on which canopy "dishes." Check T. O.).
5. Lock shoulder harness.
6. Position self in seat (head back, feet in stirrups, arms in armrests).
7. Eject.
8. Separate from seat immediately. (The lap belt should be unfastened below 2000'.)
9. Pull ripcord (Delay pulling until below 25,000' and until you have decelerated to terminal velocity if altitude permits).

NOTE: When time and altitude are at a premium, steps 4, 6, 7, 8 and 9 will suffice.

"I'M an ejectee! The main reason that I'm here to write my story is my ejection seat. Secondly, in my case is the fact that I had a wingman who gave me early warning of my difficulties.

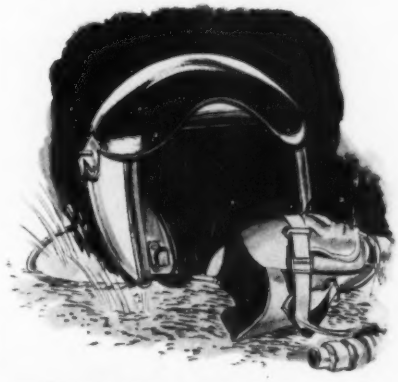
"We took off in our F-86D's early one morning from an East Coast air base. The next four minutes were the most exciting in my life.

"Immediately after becoming airborne I discovered that I had lost my main flight control system. Notifying my wingman of the difficulties, I made a turn back toward the base, intending to make an immediate landing. The wingman advised that my aircraft was on fire in the vicinity of the right wing root. At this time I was flying at about 220 knots and altitude was 1000 feet. I could not see the fire from the cockpit nor at any other time while in the aircraft did I see or have any instrument indication of the conflagration.

"I continued a full power climbing turn back toward the base and asked my wingman if he thought that I could make it. He replied in the negative, stating a panel had just burned away and that the fire was increasing in intensity. He suggested an immediate bailout. Right then and there I resigned myself to an ejection and rid my mind completely of any other course of action.

"With casual clarity of thought, I loosened my safety belt and shoulder harness. Not being completely sure of my altitude, I decided to employ the low altitude bailout procedure. I raised the right armrest which immediately blew the canopy and at the same time my helmet was carried away.

"My helmet was equipped with a visor and I had intended to lower it before ejecting, but didn't feel that this act was necessary until after the canopy was gone. Apparently my lack of concern was based on numerous reports of canopy loss on takeoff without loss of the pilot's helmet. My case disproved that theory as far as I was concerned.



Delayed Bailout

"I delayed my ejection for at least 30 seconds after the canopy had gone in order to police the cockpit. I carefully positioned the seat belt to avoid a possible snag, placed the shoulder harness straps neatly over my shoulders, and removed the oxygen hose clip from my clothing. Considering my predicament, I now consider these actions rather superfluous for they could have proved costly under any but an ideal condition. Had my aircraft been uncontrollable, this casual approach might well have put me on the statistical side of an accident report.

"At no time was the wind blast severe and I encountered no buffeting. No difficulty was experienced in operating the seat armrest or trigger and I was able to keep the airplane in a climbing turn to the right. Just before triggering out, I positioned myself and my last thought was, 'I wonder what the . . . this is going to be like.' I squeezed the trigger and was gone!

"My world turned into a gray nightmare of terrific blasts and indescribable gyrations. (My wingman saw me eject and stated that I made just one slow, fully outstretched flip, leaving the seat almost immediately on clearing the aircraft. He said that the seat and I both cleared the ship by about thirty feet.)

"When my faculties and power of sight returned, I was face down, fully spread-eagled. I had no sense of falling. I just felt suspended in space with a slight sound of rushing wind in my ears. I had no difficulty reaching the ripcord and assume that I would have had no difficulty in releasing my seat belt had I been wearing one. The chute blossomed out with a moderate shock and I glanced up and thought, 'Boy, that really looks beautiful!' It was a wonderful feeling to suddenly realize that I had made the grade. I had ejected at well over 300 knots and was all in one piece.

"I purposely delayed opening my chute until I was certain that my forward speed had slowed sufficiently to insure keeping the jump sack intact. By waiting until I could see, I had reasoned that I had slowed down sufficiently.

"I had no feeling of descending until the last few hundred feet when the ground appeared to rise toward me rapidly. I landed in a sod field (the only one for miles around) with a moderate 'thump.' The landing wasn't nearly as hard as I had expected. For the record I am six feet one and weigh 210 pounds.

Controlled Chute

"During the descent I managed to control the oscillation pretty well, but came down all the way backwards. I knew the theory of turning, but the first attempt resulted in partial spillage of the chute and some additional oscillation. At this point I decided to leave well enough alone and just go along for the ride.

"My only injuries were two gouges on my forehead caused by the nose piece of my sunglasses. The glasses parted company when the oxygen mask was pulled over my face as the helmet was carried away. I also bruised my left ankle a bit, but I am sure that this was because I didn't have my left foot firmly in the stirrup at the time of ejection.

"My only previous parachute and ejection training had been lectures and the information contained in the Pilots Operating Instructions for the various aircraft I had flown. I feel, however, that this is adequate information for the accomplishment of a safe emergency ejection.

"As in any similar situation, I feel that I *could* have done it better but believe me I am more than satisfied with the outcome of this jump. Here are my mistakes, as I see them now:

1. The helmet visor should have been lowered prior to blowing the canopy.

2. The sunglasses should have been removed as soon as the emergency was recognized.

3. I should have planted both feet *firmly* in the stirrups.

4. Although I wasn't able to control my chute very well, almost any form of landing is preferable to dumping in backwards. (I was just lucky!)

"In a final summation, I can safely say that I believe the ejection seat is here to stay. Confidence in the mechanism leads to peace of mind. I knew that I would not hit any part of the airframe structure and consequently was able to carefully plan each step of my 99 and 44/100% safe ejection. If the necessity for bailout arises again, I'll be even better prepared as the result of this experience." ●

CROSSFEED

LETTERS TO THE EDITOR

. . . . From Greece

Congratulations to Master Sergeant Keck and to the pilots of the 1002nd Inspector General Group for their outstanding record of 117 landings on one set of T-33 tires.

We, of the USAF Section, JUSMAG (Greece), are equally proud of the record here in Greece.

During the initial jet transition phase of the Royal Hellenic Air Force, considerable difficulty was encountered in the program because of a shortage of tires. However, this shortage, which threatened to retard the pilot training program from the very start, was met and solved by the RHAF pilots and mechanics themselves. Careful maintenance supervision on proper tire inflation and thorough briefing of pilots on brake usage enabled them to attain on a number of occasions between 120-130 landings per set of tires.

Most important of all, however, is the fact that this critical period led to the establishment of good flying and maintenance habits with the result that today they are bettering their previous record. During the period 2 February 1953—16 July 1953, an *average* of better than 120 landings were made per tire. Such an achievement on the part of one of our allies is worthy of our highest admiration.

Captain S. Mamalis
JUSMAG (Greece)
APO 206, c/o PM, New York.

★ ★ ★

. . . . From Langley AFB

We've noticed the article on page 26 of Flying Safety Magazine for July 1953, concerning M/Sgt Keck's admirable record of 117 landings on his T-33 aircraft and requesting information on comparable records.

When our squadron, the 511th Fighter-Bomber Squadron, was stationed at Eglin AFB, Aux. #2, from November, 1952 through April, 1953, we accumulated some landings on our tires, the number of which we estimated to be slightly above average. We kept a cumulative daily total on the aircraft logs to aid us in planning our requirements for tires. We still have these records.

On our T-33, crewed by A/1C Winfred T. Seay, we accumulated 184 landings on one tire and 197 landings on its mate. We had two more tires that went to 164 landings; one tire to 170 landings; several to 140 plus landings, and a majority of our tires were landed upwards of 125 times.

We feel that we were able to do this because we had an 8000-foot runway that was asphalt-gravel topped, and also because of a braking technique evolved by our Squadron CO, Maj. Charles H. Spencer, and our Operations Officer, Maj. William O. Sneed.

The technique designed by our CO and Ops Officer was to land 1000 feet down the runway—because of unfavorable approaches, and then roll free for 4000 feet, using the final 3000 feet for braking. The braking action used was the rolling friction type and the brakes were held from two to three seconds and allowed to cool for at least an equal period before braking action was re-applied.

Capt. Daniel S. Elliot
Asst Ops Officer
511th FBS Oprns, Langley.

★ ★ ★

. . . . From Bryan AFB

On page 26 of FLYING SAFETY for July, 1953, M/Sgt Keck looks very doubtful about 117 landings being a record for a pair of 26 x 6.6 tires, and for good reason we think!

From November, 1952, through April, 1953, we conducted a service test on retreaded 26 x 6.6 tires and we have reason to believe that the results might be of interest to the 1002nd IG Group.

One hundred ninety eight (198) tires were made available for the test. Two of these tires were found to be faulty prior to installation, leaving 196 tires that were actually tested. Ninety six (96) of the tires tested had more than 117 landings at the time of removal. In fact, one of these tires had a total of 233 landings.

Records were kept numerically by test number which would necessitate extensive research to determine the landings on each set. A quick check, however, revealed that the tires removed from Aircraft 51-6778 had the following number of landings:

Serial No.	Test Pos. No.		Date Rem.	No. of Ldgs.
TT 1739	9	Left	4-2-53	187
004525565L	9	Right	4-2-53	215

We might mention here that these tires were installed on T-33A aircraft used in training student pilots.

Maj. Wm. Greenwood
3530th Plt Trng Wing
Bryan AFB, Texas.

★ ★ ★

Preflight Service

I wish to echo the sentiments of Captain Garrison's Crossfeed item, "What, No Screw Driver?", in September FLYING SAFETY.

Flying F-51s from Hq USAF flight facilities has forced me to carry a tool kit, i.e., screw driver and water pump pliers, since tools are necessary to perform an adequate preflight safety check on fuel, oil, and in the case of the F-51, coolant.

Another gripe I have is the caliber of service performed at some airfields. For instance, on my last trip to the West Coast, my preflight inspection at two stops resulted in finding the oil cap on top of the oil tank, or hanging at the end of its chain. This happened three times within a year and twice at the same place.

It seems to me that Flying Safety would have a real interest in this type of service and that our safety record definitely will be related to the number of mistakes made in this manner. And with the advent of jet air-

craft, well this becomes many, many more times serious.

This should serve to point up the need for pilots to be sure to check their aircraft prior to takeoff.

Lt. Col. Donald L. Rodewald
Hq, USAF.

★ ★ ★

NOTAMS in Color

The question of checking NOTAMS along a proposed route has always been one in my mind which was determined by the length of time I had to wait to get my airplane gassed or had to wait for a passenger.

Almost all of the operations offices that I have visited have Kardex files with NOTAMS filed by States. To check a flight path properly, it required looking into several drawers while consulting a map to determine your flight path. Needless to say this has been rarely done. We have a system at Kirtland AFB which should simplify the matter, and although it may not be original, I have never seen a similar layout.

In essence it is a NOTAM index with each NOTAM on file indicated by a colored pin placed on a (AP-9) map. The color of the pin indicates the type facility reported. By tracing your flight path along the map you can determine, by the location of the pins and their color, whether the NOTAM will influence your flight.

The colors utilized at this station are:

Color	*NOTAMS pertaining to:*
Maroon	Condition of runways, taxiways, aprons, etc.
Green	Servicing, fuel non-availability, etc.
Black	RON Restrictions—Qtrs.
Orange	Firing—AA—Bombing.
Yellow	Official Business Only.
Purple	Airfield Lighting.
Gold	Landing Aids—ILS—GCA.
Blue	Radio Aids—Range, VAR, VOR.
Lt. Green	Instrument Flight Restrictions and Procedures.
Pink	Night Operation Restrictions and Hours.

Thus a pilot tracing his flight path would not have to look at NOTAMS other than those marked BLUE or ORANGE unless he contemplated landing, and would not have to check those for BLACK at his destination if he planned to stop for servicing.

By simply placing a pin when filing a NOTAM, and removing it when withdrawing one from the file, the board is kept up to date.

It is believed that if this system is implemented at other bases that pilots would be encouraged to check the pertinent NOTAMS. By using the same colors, pilots would soon know the significance of pins and it would reduce the need for checking the color code.

Capt. James R. McCullough
Asst Base Ops Officer
Kirtland AFB, New Mexico

★ ★ ★

No "Breath of Life"

On page seven of the July issue of FLYING SAFETY appears an article on the D-1, D-2 series of oxygen regulators entitled "The Breath of Life."

In the next to the last paragraph, a statement is made that the D-2 will sustain life at altitudes up to 80,000 feet, provided the proper counterpressure exists. The D-2 regulator does not differ in operational ceiling from the D-1 in this respect. Neither regulator can sustain life at 80,000 feet. The maximum altitude for extended periods of time using either the Type D-1 or D-2 regulator is 43,000 feet. Both regulators may be used for a few minutes in emergencies at altitudes up to 48,000 feet....

For your information, all D-1 regulators are being scheduled for rework into the latest Type D-2 configuration so that within the next year all regulators of this series should be identical.

It is true, as stated in the final paragraph, that the D-2 will soon be used in conjunction with the T-1 High Altitude Suit; however, an additional "emergency" regulator is required for this purpose. This regulator is attached to a high pressure cylinder and the combination is known as the Type C-1 cylinder and regulator assembly. The assembly provides oxygen not only for pressurizing the suit, but also delivers a high positive pressure to the mask which in effect overrides any pressure delivered from the D-2 regulator. It is intended to serve in emergencies if the cabin pressure fails at altitudes above 43,000 feet.

Donald R. Good
Chief, Eng. & Dev. Br
AeroMed Lab
Wright-Patterson AFB.

★ ★ ★

Our proofreader is rolling in sackcloth and ashes. And we thank you for writing us.

★ ★ ★

Airscoop Landing

We've read the Keep Current item, "F-51 Retracted Tailwheel," from a recent issue of FLYING SAFETY. The answer to landing an F-51H with a retracted tailwheel is to lower the scoop to full manual position and land on the scoop. This has been done several times with only minor sheetmetal work required on scoop.

Col. John B. Coleman, USAF
Senior Air Instructor
Dept. of Military Affairs
State of Pennsylvania

★ ★ ★

This is a new "scoop." Do any peashooter pilots wish to add to or comment on Colonel Cushman's recommendation? The new T. O. for the F-51H calls for the tailwheel to be down and manually locked at all times. However, if the tailwheel is not faired in well, there is a remote possibility of exhaust fumes being drawn back up into the cockpit.

USAF's new RC-121C carries six tons of electronic equipment. The dorsal-like hump on the back, the bulge underneath and the elongated nose house radar antennae. It is powered with turbo-compound engines and cruises over 300 MPH.

WELL DONE!

FOR many years FLYING SAFETY has recognized outstanding feats of airmanship through the medium of the "Well Done" page. We feel that the least we can do is salute the individual or group who performs in an outstanding manner under the stress of emergency.

Because of a recent change in "Well Done" policy, however, a word of explanation is in order.

The Office of the Deputy Inspector General, USAF, has notified all major commanders that in the future, nominees selected for recognition in the "Well Done" feature of Flying Safety Magazine *will be recommended for commendation by the Chief of Staff, USAF.*

Major commanders have been invited to submit their own nominations for "Well Done" recognition and a board of officers in the office of the Deputy Inspector General will make final selections.

Recipients of the "*Well Done*" award will also receive the original artwork, as prepared for publication in Flying Safety Magazine.

When no nominations considered worthy of recognition are received, a "*Well Done*" feature will not be used that month. Only those persons considered to have performed outstanding feats of airmanship and thereby have prevented a serious accident will be eligible for the recognition.

In the event a nomination for "*Well Done*" recognition is received from an individual or subordinate unit, such nomination will be referred to the appropriate major commander to determine if he wishes to endorse it as his official selection.

FLYING SAFETY welcomes this procedure. We feel that a wider choice of nominees will now be possible and insure giving recognition for the *best "Well Done."*

Streamlined on Ice...

For skating, that is. For flying it's a different story altogether. On your airplane, clear ice usually starts forming by closely following the wing contour, and builds forward in a blunt, unstreamlined mass. When you do encounter clear ice, just bear in mind that, like the skaters, you must keep your airspeed on the high side when you make those turns.

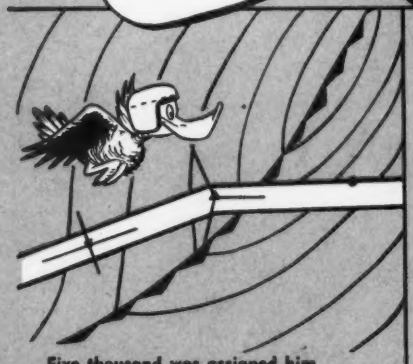
don't be a warm weather pilot in winter -- watch for ice!

KNOW YOUR ALTIMETER

Your Altimeter Can't Think For You!

-- Reset Over Every Station --

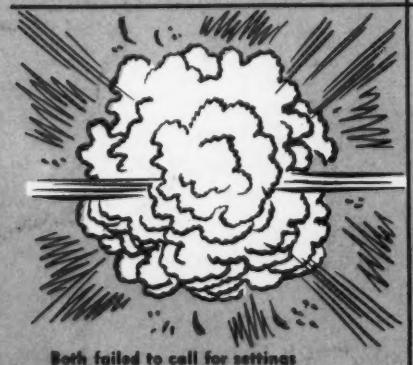
This bird took off from Texas
With many miles to go
'Twas lousy weather along the route
Altimeter — twenty nine-six-0



Five thousand was assigned him
And cold fronts forecast, too,
But he forgot 'bout pressure change—
Kept boring right on thru . . .

Another bird was westbound
Six thousand was assigned
Altimeter set for thirty-six
And here now comes the bind

They both held altitude right well
According to their clocks,
Forgetting that in frontal passage
Pressure climbs or drops



Both failed to call for settings
While stations sizzled by
They both homed in on one last range—
They met there, in the sky

One spun down into the ground
The other got away
Though ripped and torn and really shook
He'll fly again some day

Had both these birds checked pressure
Along the right of way
'Tis plain to see that two—not one
Would be with us today.

☆ U. S. GOVERNMENT PRINTING OFFICE 1953--